

## IBM 128 GB and 256 GB SATA 2.5" MLC Entry SSDs

### IBM Redbooks Product Guide

The IBM® 128 GB and 256 GB solid-state drives (SSDs) employ cost-effective MLC NAND technology to bring an affordable and performance-driven solution for read-intensive applications. The new SSD drives will each be available in a 2.5-inch SFF with both simple-swap and hot-swap options. These SSDs use a single-chip controller with a SATA interface on the system side and *n*-channels of Micron NAND Flash internally. Packaged in an HDD replacement enclosure, these SSDs integrate easily in existing storage infrastructures.

Figure 1 shows IBM SATA 2.5" MLC Entry SSD.



Figure 1. IBM SATA 2.5" MLC Entry SSD

### Did you know

Solid-state drives have more than 100 times better IOPS performance and lower access latency with significantly reduced power consumption compared to traditional spinning hard disk drives.

Entry MLC SSDs and Enterprise MLC SSDs have similar read and write IOPS performance, but the key difference between them is their endurance (or life time) (that is, how long they can perform write operations because SSDs have a finite number of program/erase (P/E) cycles). Entry SSDs have a better \$/IOPS ratio but lower endurance compared to Enterprise SSDs. Because of that, Entry SSDs are ideal for web serving, video on demand, data warehouse, content delivery, and other read-intensive random workloads.

Providing that additional peace of mind, IBM 128 GB and 256 GB MLC SSDs are covered under IBM warranty. These drives carry a 1-year limited warranty, or when installed in an IBM System x® server, these drives assume your system's base warranty.

## Part number information

Table 1 lists the information for ordering part numbers and feature codes.

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
IBM 128GB SATA 2.5" MLC HS Entry SSD	90Y8648	A2U4
IBM 128GB SATA 2.5" MLC SS Entry SSD	90Y8668	A2UB
IBM 256GB SATA 2.5" MLC HS Entry SSD	90Y8643	A2U3
IBM 256GB SATA 2.5" MLC SS Entry SSD	90Y8663	A2UC

The part numbers include the following items:

- One SSD mounted on a 2.5" hot-swap drive tray (HS Entry SSDs) or 2.5" simple-swap drive tray (SS Entry SSDs)
- Support Flyer for SSD
- Warranty Flyer
- Important Notices Flyer

## Features

- 2.5-inch industry standard form factor that fits into a conventional disk drive bay
- SATA 6 Gbps interface
- Utilization of industry-leading 25 nm MLC
- Cost-effective MLC NAND technology with high read performance
- Enterprise Data Path Protection to ensure NAND integrity
- Endurance: 72 TB of total bytes written (TBW) at 90% full disk based on predefined usage pattern (see explanation below)
- Energy-saving 2.5 - 3.5 watt power consumption per drive
- Absence of moving parts reduces potential failure points in the server
- Native command queuing support
- Self-monitoring, analysis, and reporting technology (SMART) command set

It is important to distinguish these 128 GB and 256 GB entry-level drives from the Enterprise drives. Enterprise drives have much higher write endurance, and as a result can withstand a greater number of writes over the lifetime of the device compared to entry-level drives. SSD write endurance is typically measured by the number of program/erase (P/E) cycles, that the drive incurs over its lifetime, listed as TBW in the device specification.

The TBW value assigned to a solid-state device is the total bytes of written data (based on the number of P/E cycles) that a drive can be guaranteed to complete (% of remaining P/E cycles = % of remaining TBW). Reaching this limit does not cause the drive to immediately fail. It simply denotes the maximum number of writes that can be guaranteed. A solid-state device will not fail upon reaching the specified TBW. At some point based on manufacturing variance margin, after surpassing the TBW value, the drive will reach the end-of-life point, at which the drive will go into a read-only mode. Because of such behavior by entry-level solid-state drives, careful planning must be done to use them only in read-intensive environments to ensure that the TBW of the drive will not be exceeded prior to the required life expectancy.

The endurance of 128 GB and 256 GB drives is specified based on the following access pattern: 50% random data and 50% sequential data with block size mixes of 5% of the data as 4 KB block size, 5% of the data as 8 KB block size, 10% of the data as 16 KB block size, 35% of the data as 64 KB block size, and 35% of the data as 128 KB block size. The entry-level drives described here are capable of 72 TB of lifetime writes, with the workload stated above as the worse case. For the device to last five years inside of the 72 TB of TBW, the drive write workload must be limited to no more than 40 GB of writes per day. For the device to last three years, the drive write workload must be limited to no more than 65 GB of writes per day.

## Technical specifications

Table 2 presents technical specifications for the 2.5-inch solid-state drives.

Table 2. Entry SSD technical specifications

Specification	IBM 128GB SATA 2.5" MLC HS Entry SSD	IBM 128GB SATA 2.5" MLC SS Entry SSD	IBM 256GB SATA 2.5" MLC HS Entry SSD	IBM 256GB SATA 2.5" MLC SS Entry SSD
Part number	90Y8648	90Y8668	90Y8643	90Y8663
Interface	SATA 6 Gbps	SATA 6 Gbps	SATA 6 Gbps	SATA 6 Gbps
Hot-swap drive	Yes	No	Yes	No
Form factor	2.5" SFF	2.5" SFF	2.5" SFF	2.5" SFF
Capacity	128 GB	128 GB	256 GB	256 GB
IOPS read*	45,000	45,000	45,000	45,000
IOPS write*	35,000	35,000	50,000	50,000
Sequential read rate**	500 MBps	500 MBps	500 MBps	500 MBps
Sequential write rate**	175 MBps	175 MBps	260 MBps	260 MBps
Read latency	55 µs	55 µs	55 µs	55 µs
Write latency	55 µs	55 µs	55 µs	55 µs
Shock, operating	1500 G/1.0 ms	1500 G/1.0 ms	1500 G/1.0 ms	1500 G/1.0 ms
Vibration, operating	2-500 Hz at 3.1 G	2-500 Hz at 3.1 G	2-500 Hz at 3.1 G	2-500 Hz at 3.1 G
Maximum power, reads	2.0 W	2.0 W	2.2 W	2.2 W
Maximum power, writes	3.5 W	3.5 W	4.0 W	4.0 W

\* 4 KB block transfers

\*\* 128 KB block transfers

## Supported servers

The solid-state drives can be installed in the System x servers identified in Table 3 and the BladeCenter® and iDataPlex servers identified in Table 4.

Table 3. Supported System x servers

Product description	Part number	x3100 M4 (2582)	x3200 M3 (7327, 7328)	x3250 M3 (4251, 4252)	x3250 M4 (2583)	x3400 M3 (7378, 7379)	x3500 M3 (7380)	x3500 M4 (7383)	x3550 M3 (7944)	x3550 M4 (7914)	x3620 M3 (7376)	x3630 M3 (7377)	x3650 M3 (7945)	x3650 M4 (7915)	x3690 X5 (7147)	x3755 M3 (7164)	x3850 X5 (7143)
IBM 128GB SATA 2.5" MLC HS Entry SSD	90Y8648	N	Y	Y	Y	Y	Y	N	Y	N	N	Y	Y	N	Y	N	Y
IBM 128GB SATA 2.5" MLC SS Entry SSD	90Y8668	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N
IBM 256GB SATA 2.5" MLC HS Entry SSD	90Y8643	N	Y	Y	Y	Y	Y	N	Y	N	N	Y	Y	N	Y	N	Y
IBM 256GB SATA 2.5" MLC SS Entry SSD	90Y8663	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N

Table 4. Supported BladeCenter and iDataPlex servers

Product description	Part number	HS12 (8028)	HS21 (8853)	HS21 XM (7995)	HS22 (7870)	HS22V (7871)	HS23 (7875)	HX5 (7872)	HX5 (7873)	LS22 (7901)	LS42 (7902)	JS12 (7998-60X)	JS23/43 (7778)	PS700/1/2 (8406)	PS703/4 (7891)	dx360 M3 (6391)	dx360 M4 (7912)
IBM 128GB SATA 2.5" MLC HS Entry SSD	90Y8648	N	N	N	Y	N	Y	N	N	N	N	N	N	N	N	Y	N
IBM 128GB SATA 2.5" MLC SS Entry SSD	90Y8668	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y
IBM 256GB SATA 2.5" MLC HS Entry SSD	90Y8643	N	N	N	Y	N	Y	N	N	N	N	N	N	N	N	Y	N
IBM 256GB SATA 2.5" MLC SS Entry SSD	90Y8663	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y

See the IBM ServerProven® website for the latest compatibility information for System x servers:  
<http://ibm.com/servers/eserver/serverproven/compat/us/>

## Supported disk controllers

The solid-state drives require a supported disk controller. Table 5 lists the System x controllers that support solid-state drives installed in a supported server.

Table 5. RAID controllers for System x servers supported with internal solid-state drives

RAID controller	Part number	x3200 M3 (7327, 7328)	x3250 M3 (4251, 4252)	x3250 M4 (2583)	x3400 M3 (7378, 7379)	x3500 M3 (7380)	x3550 M3 (7944)	x3620 M3 (7376)	x3630 M3 (7377)	x3650 M3 (7945)	x3690 X5 (7147)	x3850 X5 (7143)	HS22 (7870)	HS23 (7875)	dx360 M3 (6391)	dx360 M4 (7912)
Integrated LSI SAS1064e (HS22)	Onboard	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N
Integrated LSI SAS2004 (HS23)	Onboard	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
ServeRAID M5120	81Y4478	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID M5110e	Onboard	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID M5110	81Y4481	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID M1115	81Y4448	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y
ServeRAID H1110	81Y4492	Y	Y	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	Y
ServeRAID M5025	46M0830	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID M5016	90Y4304	N	N	N	N	N	Y	N	N	Y	N	N	N	N	N	N
ServeRAID M5015	46M0829	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N
ServeRAID M5014	46M0916	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N
ServeRAID M1015	46M0831	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N
ServeRAID B5015	46M0969	N	N	N	N	N	Y	N	N	Y	Y	Y	N	N	N	N
IBM 6 Gb Performance Optimized HBA	46M0912	N	N	N	N	N	Y	N	N	Y	Y	Y	N	N	Y	Y
IBM 6 Gb SAS HBA	46M0907	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
IBM 3 Gb SAS HBA v2	44E8700	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID MR10M	44E8825	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID MR10i	43W4296	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID BR10i	44E8689	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID BR10il v2	49Y4731	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ServeRAID-MR10ie (CIOv)	46C7167	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N

## Supported operating systems

Solid-state drives operate transparently to users, storage systems, applications, databases, and operating systems. The controllers that support SSDs are supported by the following operating systems:

- Microsoft Windows Server 2003, Web Edition
- Microsoft Windows Server 2003/2003 R2, Datacenter Edition
- Microsoft Windows Server 2003/2003 R2, Datacenter x64 Edition
- Microsoft Windows Server 2003/2003 R2, Enterprise Edition
- Microsoft Windows Server 2003/2003 R2, Enterprise x64 Edition
- Microsoft Windows Server 2003/2003 R2, Standard Edition
- Microsoft Windows Server 2003/2003 R2, Standard x64 Edition
- Microsoft Windows Server 2008 Foundation
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2008, Datacenter x64 Edition
- Microsoft Windows Server 2008, Datacenter x86 Edition
- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Enterprise x86 Edition
- Microsoft Windows Server 2008, Standard x64 Edition
- Microsoft Windows Server 2008, Standard x86 Edition
- Microsoft Windows Server 2008, Web x64 Edition
- Microsoft Windows Server 2008, Web x86 Edition
- Microsoft Windows Small Business Server 2003/2003 R2 Premium Edition
- Microsoft Windows Small Business Server 2003/2003 R2 Standard Edition
- Microsoft Windows Small Business Server 2008 Premium Edition
- Microsoft Windows Small Business Server 2008 Standard Edition
- Red Hat Enterprise Linux 4 AS for AMD64/EM64T
- Red Hat Enterprise Linux 4 AS for x86
- Red Hat Enterprise Linux 5 Server Edition
- Red Hat Enterprise Linux 5 Server Edition with Xen
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- SUSE LINUX Enterprise Server 10 for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 for x86
- SUSE LINUX Enterprise Server 10 with Xen for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for x86
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- VMware ESX 4.0
- VMware ESX 4.1
- VMware ESXi 4.0
- VMware ESXi 4.1
- VMware vSphere 5

See the IBM ServerProven website for the latest information about the specific versions and service packs supported: <http://ibm.com/servers/eserver/serverproven/compat/us/>. Click **System x servers**, then **Disk controllers** to see the support matrix. Click the check mark that is associated with the System x server in question to see the details of the operating system support.

## Warranty

There is a 1-year, customer-replaceable unit (CRU) limited warranty. When installed on a System x server, these drives assume your system's base warranty and any IBM ServicePac® upgrade.

## Physical specifications

The IBM 128 GB and 256 GB SATA 2.5-inch MLC HS and SS Entry SSDs have the following physical specifications.

Dimensions and weight (approximate):

- Height: 7 mm (0.6 in.)
- Width: 70 mm (2.75 in.)
- Depth: 100 mm (4.0 in.)
- Weight: 73 g (0.2 lb)

Shipping dimensions and weight (approximate):

- Height: 63 mm (2.5 in.)
- Width: 174 mm (6.85 in.)
- Depth: 133 mm (5.2 in.)
- Weight: 433 g (1.0 lb)

## Operating environment

The IBM 128 GB and 256 GB SATA 2.5-inch MLC HS and SS Entry SSDs are supported in the following environment:

- Temperature: 0 - 70 °C (32 - 158°F) at 0 - 914 m (0 - 3,000 ft)
- Relative humidity: 8 - 85% (noncondensing)
- Maximum altitude: 3,050 m (10,000 ft)

## Agency approvals

The drives have the following agency approvals:

- UL
- CSA
- TUV
- CE Mark
- C-Tick Mark
- IEC
- Taiwan (BSMI Certification)
- Korea EMI
- EMC
- FCC
- VCCI

## Related publications

For more information see the following documents:

- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-013>
- IBM Redbooks® ServeRAID Adapter Quick Reference  
<http://www.redbooks.ibm.com/abstracts/tips0054.html?Open>
- *IBM System x Configuration and Options Guide*  
<http://www.ibm.com/support/docview.wss?uid=psg1SCOD-3ZVQ5W>



# Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service. IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing, IBM Corporation, North Castle Drive, Armonk, NY 10504-1785 U.S.A.*

**The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:** INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you. This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk. IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you. Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products. This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

## COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

**© Copyright International Business Machines Corporation 2012. All rights reserved.**

Note to U.S. Government Users Restricted Rights -- Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

This document was created or updated on March 21, 2012.

Send us your comments in one of the following ways:

- Use the online **Contact us** review form found at:  
[ibm.com/redbooks](http://ibm.com/redbooks)
- Send your comments in an e-mail to:  
[redbook@us.ibm.com](mailto:redbook@us.ibm.com)
- Mail your comments to:  
IBM Corporation, International Technical Support Organization  
Dept. HYTD Mail Station P099  
2455 South Road  
Poughkeepsie, NY 12601-5400 U.S.A.

This document is available online at <http://www.ibm.com/redbooks/abstracts/tips0879.html> .

## Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. These and other IBM trademarked terms are US registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at <http://www.ibm.com/legal/copytrade.shtml>. The following terms are trademarks of the International Business Machines Corporation in the United States, other countries, or both:

BladeCenter®  
IBM®  
Redbooks®  
Redpaper™  
Redbooks (logo)®  
ServerProven®  
System x®

The following terms are trademarks of other companies:

Microsoft, Windows, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.